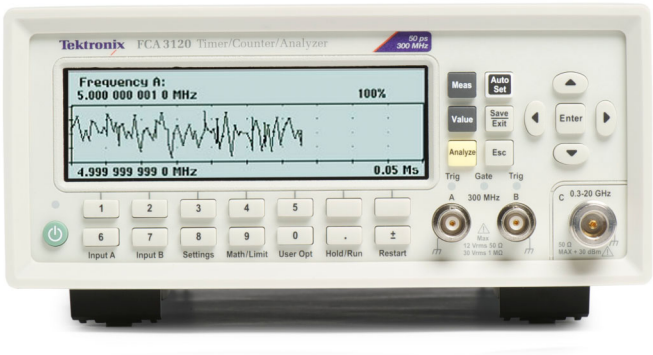
Timer/Counter/Analyzers

Tektronix FCA3000 and FCA3100 Series Data Sheet



Features & Benefits

Key Performance Specifications

- 300 MHz, 3 GHz, 20 GHz Models
- Up to 3 Input Channels
- 50 ps (FCA3100 Series) or 100 ps (FCA3000 Series) Single-shot Time Resolution
- 12 Digit/s Frequency Resolution
- 0.001° Phase Resolution
- 3 mV or better Voltage Resolution
- Optional 5×10^{-8} High-stability Oven Time Base

Measurement Throughput

- 250k Sample/s Data Transfer Rate to Internal Memory (Up to 3.75M samples stored)
- Up to 15k Sample/s Data Transfer Rate over USB/GPIB Bus (Block mode)
- Up to 650 Individually Triggered Measurements/s

Available Functions and Features

- Automated Measurements: Frequency, Period, Ratio, Time Interval, Time Interval Error, Pulse Width, Rise/Fall Time, Phase Angle, Duty Cycle, Maximum Voltage, Minimum Voltage, Peak-to-Peak Voltage
- Totalize Measurement (FCA3100 Series)
- Multi-parameter Display
- Trend Plot Mode
- Measurement Statistics Mode
- Histogram Mode
- Allan Deviation
- Zero Dead-time Frequency/Period Measurements
- Continuous Data Streaming over USB/GPIB Bus during Measurement (FCA3100 Series)
- Programmable Pulse Output from 0.5 Hz to 50 MHz

Connectivity

- Optional Rear-panel Inputs
- USB Device and GPIB Ports on Rear Panel for Quick PC Connectivity
- GPIB Interface Supports Full SCPI-compatible Programmability and offers an Emulation Mode for Plug-and-Play Replacement in Existing ATE Systems
- External Arming Input
- 10 MHz Reference Oscillator Output
- Includes National Instrument's LabVIEW SignalExpress™ TE Limited Edition Software for Connecting Your Bench
- Optional TimeView™ Software Available for Modulation Domain Analysis

3-year Warranty

Tektronix®

Feature-rich Tools for Precision Measurements

The FCA3000 and FCA3100 Timer/Counter/Analyzer Series pack many different functions into one feature-rich instrument. With industry-leading frequency and time resolution, the FCA Series comes standard with deep internal memory and a fast data transfer rate of 250k Samples/s to internal memory. In addition, the multi-parameter display shows auxiliary measurements alongside your main measurement to provide you with the results you need at a glance. With the industry's most comprehensive analysis modes, including measurement statistics, histograms, and trend plots, you have the tools you need to quickly and accurately analyze your signal.

Industry-leading Performance for Demanding Designs

High-resolution is critical for R&D and production testing on today's demanding designs. The FCA Series delivers 12-digit/s frequency resolution and for time measurements, single-shot resolution of 50 ps (FCA3100 Series) or 100 ps (FCA3000 Series) is available with measurement values displayed up to 14 digits. With industry-leading performance, the FCA Series provides you with fast, precise measurements.

Unique Features for Accurate Measurements

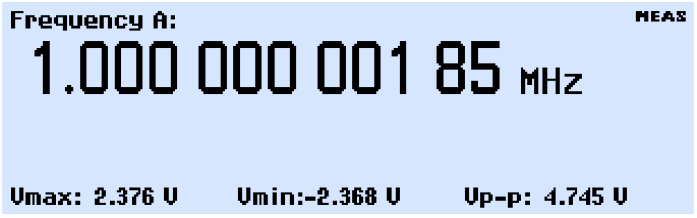
To ensure correct measurements of Allan Deviation, the FCA3100 Series offers a zero dead-time measurement technique and continuous time stamping of trigger events. This feature is vital for mechanical and medical measurements where every single cycle must be measured. The FCA3000 Series offers this functionality through the USB/GPIB interfaces with a raw time-stamping function.

For correct calculation of statistical parameters, the FCA Series comes standard with limit qualifying capability. By setting limits, you can isolate one cluster in your calculation. This is important for applications such as verifying the jitter of digital pulses that appear in discrete clusters in CD players or in HDB3-coded data.

Also available is hysteresis compensation for time interval measurements. By adding hysteresis, you can reduce trigger-level error from the typical 15-20 mV found in most counters on the market today, down to a typical 2.5 mV. This means 6-8 times improved trigger precision in critical time interval measurements.

Fast Throughput Reduces Test Time

The FCA Timer/Counter/Analyzer Series offers industry-best throughput, saving you up to 90% on your testing time compared to other timer/counters on the market. Up to 250,000 measurement results per second can be stored in the internal memory. Alternatively, you can transfer up to 15,000 measurement results per second in Block mode through the GPIB or USB interface. For added flexibility, the FCA3100 Series offers a zero dead-time counter feature to continuously stream measurement data over the GPIB/USB bus during, not after, measurement. This creates a dynamic measurement and analysis system.



Multi-parameter Display.

Phase Relationship Measurement.

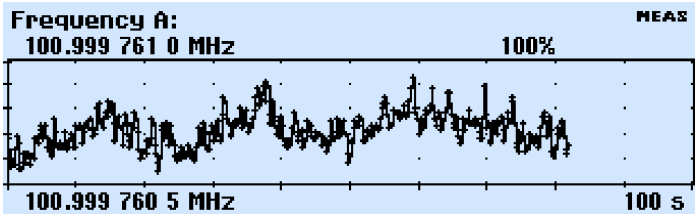
Analyze Your Device with the Industry's Only Graphical Display

With the unique display of the FCA Series, you can measure multiple parameters of the same signal from one test connection. To reveal signal quality issues like drift, intermittent transients, and stability, you can view the data as a real-time trend plot or a histogram with the FCA Series graphical display mode, or you can use measurement statistics to track how signal parameters are changing over time. A single-button Analyze mode gives you fast insight into the behavior of your device right on the timer/counter's display.

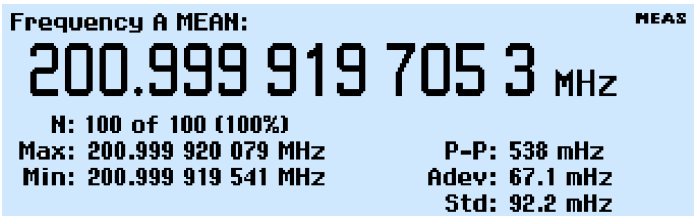
Multi-parameter Display

With the multi-parameter display, you can read important auxiliary measurement values (such as V_{max}, V_{min}, V_{p-p}, and more) displayed with your main frequency, time, period, or phase measurements. With one glance, you can see the information you need to quickly assess your device's performance.

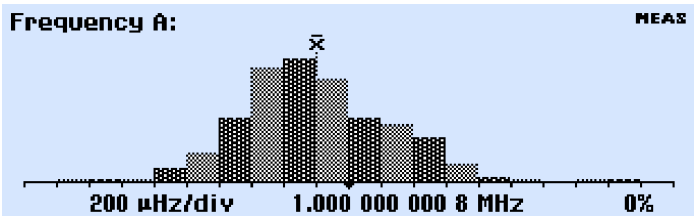
With up to 3 input channels, you can measure the relationship between different signals. For example, you can measure the phase relationship between the input and output signals of your device. You can read other critical parameters simultaneously, such as the test frequency of the signal and the voltage ratio (in dB), in one glance with the multi-parameter display.



Trend Plot Analysis.



Measurement Statistics.



Histogram Plot.

Measurement Trend Plots

Depending on your test case, your signal parameters may change from instant to instant. With the Trend Plot Analysis mode, you can graphically plot the trend of a measured value over time.

Measurement Statistics

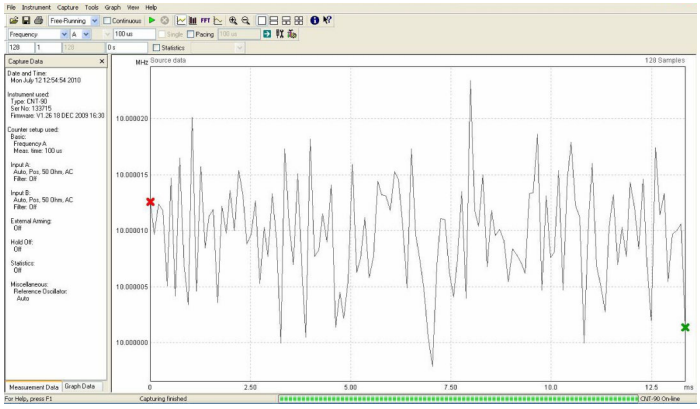
With integrated statistics processing, you can calculate the average, standard, and Allan deviation of a measurement, as well as track the minimum and maximum measured values, all with the push of a button.

Histogram Plots

To graphically see the average and standard deviation of a set of measurements, you can use the histogram function to see the distribution of measurement results.

Optional Modulation Domain Analysis

With the optional Tektronix TimeView™ software (TVA3000), the FCA Timer/Counter/Analyzer Series can become a high-performance modulation domain analyzer. With high measurement speeds (up to 250k measurement/s) and large memory depth (up to 3.75M points), fast frequency changes can be captured in real time and then analyzed with TimeView. This comprehensive software tool allows for remote instrument control, and the analysis and display of measurement results in a choice of graphs. For example, results can be displayed as raw data, statistical histogram, waveform graph (as if you were using an oscilloscope), or as an FFT spectrum graph. TimeView further allows analysis of modulation parameters like modulation depth or frequency modulation index.



Tektronix TimeView™ Software.

Designed to Make Your Work Easier

The FCA Timer/Counter/Analyzer Series are designed with the ease of use and familiar operation you have come to expect from Tektronix.

Intuitive Operation

Menu-oriented settings reduce the risk of mistakes. With dedicated and menu-driven front-panel buttons, you will have fast access to frequently used functions and parameters, reducing setup time. For example, a single-touch Analyze key toggles you between Statistics, Trend Plot, and Histogram modes.

Autoset Function

Similar to Tektronix oscilloscopes, the front-panel Autoset button will automatically set optimum trigger levels and hysteresis adapted to the actual signal applied.

Easy PC Connectivity

Connect to your PC with the rear-panel GPIB or USB device ports. The GPIB interface operates in SCPI/GPIB for plug-and-play replacement in existing ATE systems or easy integration into larger test systems. If desired, an emulation mode for existing timer/counters is available.

Connect Your Bench for Intelligent Debug

Easily capture, save, and analyze measurement results from your FCA Series timer/counter/analyzer with the special Tektronix Edition of National Instruments LabVIEW SignalExpress™ software. Every FCA Series timer/counter/analyzer ships with a free copy of the Limited Edition version of SignalExpress for basic instrument control, data logging, and analysis. The optional Professional Edition offers over 200 built-in functions that provide additional signal processing, advanced analysis, sweeping, limit testing, and user-defined step capabilities.

SignalExpress supports the range of Tektronix bench instruments*[1] enabling you to connect your entire test bench. You can then access the feature-rich tools packed into each instrument from one intuitive software interface. This allows you to automate complex measurements requiring multiple instruments, log data for an extended period of time, time-correlate data from multiple instruments, and easily capture and analyze your results, all from your PC. Only Tektronix offers a connected test bench of intelligent instruments to simplify and speed debug of your complex design.

Performance You Can Count On

In addition to industry-leading service and support, every FCA Series timer/counter/analyzer comes backed with a three-year standard warranty.

Select the Performance/Features to Meet Your Needs

Feature	FCA3100 Series	FCA3000 Series
Frequency Resolution	12 digit/s	12 digit/s
Time Resolution	50 ps	100 ps
Voltage Resolution	1 mV	3 mV
Meas. Speed to Internal Memory	250k measurement/s 3.5M results	250k measurement/s 750k results
Talker-only Output (GPIB/USB)	4k measurement/s	No
Individually Triggered Measurements	650/s	500/s
Block Transfer Speed	15k measurement/s	5k measurement/s
Frequency/Period, Time, Phase, Volt, Duty Cycle, Pulse, Rise Time	Yes	Yes
Graphic Display of Trend, Histogram, Modulation Domain	Yes	Yes
Totalize, TIE	Yes	No
Programmable Pulse Output	Yes	No
Continuous Measurements	Yes	No

*[1] For a complete listing of Tektronix instruments supported by NI LabVIEW Signal Express, visit www.tektronix.com/signalexpress.

Characteristics

Measuring Functions

All measurements are displayed with a large main parameter value and smaller auxiliary parameter values (with less resolution). Some measurements are only available as auxiliary parameters.

Frequency A, B, C

Characteristic	Description
Mode	Normal, Back-to-Back (FCA3100 Series)
Range	
Input A, B	0.001 Hz to 300 MHz
Input C	3 or 20 GHz
Resolution	12 digits in 1 s measuring time (normal) 11 digits in 1 s measuring time (back-to-back)
Aux Parameters	V_{max}, V_{min}, V_{p-p}

Frequency Burst A, B, C (FCA3020 and FCA3120 – 20 GHz Only)

Frequency and PRF of repetitive burst signals can be measured without an external control signal and with selectable-start arming delay.

Characteristic	Description
Functions	Frequency in burst (in Hz) PRF (in Hz)
Range	Input A, B, C: See Frequency spec.
Minimum Burst Duration	Down to 40 ns
Minimum Pulses in Burst	
Input A, B	3 (6 above 160 MHz)
Input C	3 × prescaler factor
PRF Range	0.5 Hz to 1 MHz
Start Delay	10 ns to 2 s, 10 ns resolution
Aux Parameters	PRF

Period A, B, C

Characteristic	Description
Mode	Single, Average, Back-to-Back (FCA3100 Series)
Range	
Input A, B	3.3 ns to 1000 s (single, average) 4.0 µs to 1000 s (back-to-back)
Input C	10 ns down to 50 ps
Resolution	100 ps (single); 12 digit/s avg. (FCA3000 Series) 50 ps (single); 12 digit/s avg. (FCA3100 Series)
Aux Parameters	V_{max}, V_{min}, V_{p-p}

Ratio A/B, B/A, C/A, C/B

Characteristic	Description
Range	(10^{-9}) to 10^{11}
Input Frequency	
Input A, B	0.1 Hz to 300 MHz
Input C	3 or 20 GHz
Aux Parameters	Freq 1, Freq 2

Time Interval A to B, B to A, A to A, B to B

Characteristic	Description
Range	Normal calculation: 0 ns to $+10^6$ s Smart calculation: -10^6 s to $+10^6$ s
Resolution	100 ps single (FCA3000 Series) 50 ps single (FCA3100 Series)
Min Pulse Width	1.6 ns
Smart Calculation	Smart Time Interval to determine sign (A before B or A after B)

Positive and Negative Pulse Width A, B

Characteristic	Description
Range	2.3 ns to 10^6 s
Min Pulse Width	2.3 ns
Aux Parameters	V_{max}, V_{min}, V_{p-p}

Rise and Fall Time A, B

Characteristic	Description
Range	1.5 ns to 10^6 s
Trigger Levels	10% and 90% of signal amplitude
Min Pulse Width	1.6 ns
Aux Parameters	Slew rate, V_{max}, V_{min}

Time Interval Error (TIE) A, B

Normalized period back-to-back measurements, calculated as TIE(k) = k * T_{REF} - $\sum T_I$, when T_I = Individual Period Back-to-Back and TREF = Reference Period Value.

Positive and Negative Duty Factor A, B

Characteristic	Description
Range	0.000001 to 0.999999
Frequency Range	0.1 Hz to 300 MHz
Aux Parameters	Period, pulse width

Phase A Relative B, B Relative A

Characteristic	Description
Range	–180° to +360°
Resolution	Single cycle: 0.001° to 10 kHz, decreasing to 1° >10 MHz. Resolution can be improved by averaging (statistics)
Frequency Range	Up to 160 MHz
Aux Parameters	Freq (A), Va/Vb (in dB)

Totalize A, B (FCA3100 Series)

Characteristic	Description
Mode	Tot A, Tot B, Tot A+B, Tot A–B, Tot A/B
Range	1 to 10^{10} counts
Frequency Range	Up to 160 MHz
Start Control	Manual, start arming
Stop Control	Manual, stop arming, timed
Aux Parameters	Other Totalize functions

V_{max}, V_{min}, V_{p-p} A, B

Characteristic	Description
Range	–50 V to +50 V, –5 V to +5 V Range is limited by the specification for max input voltage without damage (see input A, B)
Frequency Range	DC, 1 Hz to 300 MHz
Mode	V_{max}, V_{min}, V_{p-p}
Resolution	3 mV (FCA3000 Series) 1 mV (FCA3100 Series)
Uncertainty (5 V range, typical)	
DC, 1 Hz to 1 kHz	1% + 15 mV
1 kHz to 20 MHz	3% + 15 mV
20 to 100 MHz	10% + 15 mV
100 to 300 MHz	30% + 15 mV
Aux Parameters	V_{min}, V_{max}, V_{p-p}

Time Stamping A, B, C

Raw time-stamp data together with pulse counts on inputs A, B, or C, accessible through GPIB or USB only.

Characteristic	Description
Max Sample Speed	See GPIB specifications
Max Frequency	160 MHz
Time-stamp Resolution	100 ps (FCA3000 Series) 50 ps (FCA3100 Series)

Input and Output Specifications

Inputs A and B

Characteristic	Description
Frequency Range	DC Coupled: DC to 300 MHz AC Coupled: 10 Hz to 300 MHz
Impedance	1 MΩ / 20 pF or 50 Ω (VSWR ≤ 2:1)
Trigger Slope	Positive or negative
Max Channel Timing Difference	500 ps
Sensitivity	15 mV_{RMS} (DC-200 MHz) 25 mV_{RMS} (200-300 MHz)
Attenuation	X1, X10
Dynamic Range (X1)	30 mV_{p-p} to 10 V_{p-p} within ±5 V window
Trigger Level	Readout on display
Resolution	FCA3000 Series: 3 mV FCA3100 Series: 1 mV
Uncertainty (X1)	±(15 mV + 1% of trigger level)
AUTO trigger level	Trigger level is automatically set to 50% point of input signal (10% and 90% for rise/fall time)
Auto Hysteresis	
Time	Min hysteresis window (hysteresis compensation)
Frequency	One-third of input signal amplitude
Analog LP Filter	Nominal 100 kHz, RC type
Digital LP Filter	1 Hz to 50 MHz cutoff frequency
Max Voltage without Damage	
1 MΩ	350 V (DC + AC peak) to 440 Hz, falling to 12 V_{RMS} (X1) at 1 MHz
50 Ω	12 V_{RMS}
Connector	BNC

Input C – 3 GHz (FCA3003 and FCA3103 Products)

Characteristic	Description
Operating Input Voltage Range	
100 to 300 MHz	20 mV_{RMS} to 12 V_{RMS}
0.3 to 2.5 GHz	10 mV_{RMS} to 12 V_{RMS}
2.5 to 2.7 GHz	20 mV_{RMS} to 12 V_{RMS}
2.7 to 3.0 GHz	40 mV_{RMS} to 12 V_{RMS}
Prescaler Factor	16
Impedance	50 Ω nominal, VSWR < 2.5:1
Max Voltage without Damage	12 V_{RMS}, pin-diode protected
Connector	Type-N Female

Input C – 20 GHz (FCA3020 and FCA3120 Products)

Characteristic	Description
Frequency Range	0.25 to 20 GHz
Operating Input Voltage Range	
250 to 500 MHz	–21 to +27 dBm
0.5 to 14 GHz	–27 to +27 dBm
14 to 18 GHz	–27 to +27 dBm
18 to 20 GHz	–21 to +27 dBm
Prescaler Factor	128
Impedance	50 Ω nominal, VSWR < 2.0:1
AM Tolerance	>90% within sensitivity range
Max Voltage without Damage	+27 dBm
Connector	Type Precision-N Female

Rear Panel Inputs and Outputs

Characteristic	Description
Reference Input	1, 5, or 10 MHz; 0.1 to 5 V_{RMS} sine; impedance ≥1 kΩ
Reference Output	10 MHz; >1 V_{RMS} sine into 50 Ω
Arming Input	Arming of all measuring functions
Impedance	Approx. 1 kΩ
Frequency range	DC to 80 MHz
Pulse Output (FCA3100 Series)	Programmable through front GPIB/USB
Mode	Pulse Out, Gate Open, Alarm Out
Period	20 ns - 2 s, in 10 ns increments
Pulse width	10 ns - 2 s, in 10 ns increments
Output	TTL levels in 50 Ω, rise time 2 ns
Rear-panel Measurement Inputs	A, B, C (Option RP only)
Impedance	1 MΩ / 50 pF or 50 Ω (VSWR ≤ 2:1)
Connectors	SMA female for rear input C BNC for all other inputs/outputs

Auxiliary Functions

Trigger Holdoff

Characteristic	Description
Time Delay Range	20 ns to 2 s, 10 ns resolution

External Start and Stop Arming

Characteristic	Description
Modes	Start, Stop, Start and Stop Arming
Input Channels	A, B, or (rear panel) E
Max Rep. Rate for Arming Signal	
Channel A, B	160 MHz
Channel E	80 MHz
Start-time Delay Range	20 ns to 2 s, 10 ns resolution

Statistics

Characteristic	Description
Functions	Maximum, Minimum, Mean, ΔMax-Min, Standard Deviation, and Allan Deviation
Display	Numeric, histograms, or trend plots
Sample Size	2 to 2 × 10^9 samples
Limit Qualifier	Off, or capture values above, below, inside, or outside limits
Measurement Pacing	Pacing Time Range: 4 µs to 500 s

Mathematics

Characteristic	Description
Functions	(K*X+L)/M and (K/X+L)/M. X is current reading and K, L, and M are constants; set using the keyboard or as frozen reference value (X_0)

Other Functions

Characteristic	Description
Measuring Time	20 ns to 1000 s for frequency, burst, and period average. Single cycle for other measuring functions
Time-base Reference	Internal, external, or automatic
Display Hold	Freezes the result, until a new measurement is initiated through a restart
Limit Alarm	Graphical indication on front panel and/or SRQ through GPIB, plus pulse output connector (FCA3100 Series)
Limit Values	Lower limit, upper limit
Settings	Off, or alarm if value is above, below, inside, or outside limits
On Alarm	Stop or Continue
Display	Numeric + Graphic
Stored Instrument Setups	20. Instrument setups can be saved/recalled from internal nonvolatile memory. 10 can be user protected
Display	Backlit LCD graphics screen for menu control, numerical readout, and status information
Number of digits	14 digits in Numerical mode
Resolution	320 × 97 pixels

GPIB Interface

Characteristic	Description
Compatibility	IEEE 488.2-1987, SCPI 199953131A Compatibility mode
Interface Functions	SH1, AH1, T6, L4, SR1, RL1, DC1, DT1, E2
Max Measurement Rate	
GPIB	15k/5k readings/s (Block mode) 4k/- readings/s (Talker Only mode) 650/500 readings/s (individual GET triggered)
To internal memory	250k readings/s
Internal Memory Size	750k readings (FCA3000 Series) 3.75M readings (FCA3100 Series)

USB Interface

Characteristic	Description
USB Version	2.0 full speed (11 Mb/s)

Calibration

Characteristic	Description
Mode	Closed case, menu controlled
Calibration Frequencies	0.1, 1, 5, 10, 1.544, and 2.048 MHz

General Specifications

Environmental Data

Characteristic	Description
Class	MIL-PRF-28800F, Class 3
Operating Temp	0 °C to +50 °C
Storage Temp	–40 °C to +71 °C
Humidity	5-95% (10-30 °C) 5-75% (30-40 °C) 5-45% (40-50 °C)
Altitude	Operating: 2,000 m Storage: 12,000 m
Safety	Directive 2006/95/EC, EN61010-1, UL61010-1, CAN/CSA C22.2 No. 61010-1
EMC	EU Directive 2004/108/EC, EN61326-1, EN61326-2-1, Class A

Power Requirements

Characteristic	Description
Basic Version	90 to 265 V_{RMS}, 45 to 440 Hz, <40 W

Time-base Options

Characteristic	Standard	Medium Stability (MS)	High Stability (HS)
Time-base Type	TCXO	OCXO	OCXO
Uncertainty Due to –			
Aging			
Per 24h	NA	$<5\times10^{-9}$*1	$<5\times10^{-10}$*1
Per month	$<5\times10^{-7}$	$<6\times10^{-8}$	$<1\times10^{-8}$
Per year	$<5\times10^{-6}$	$<2\times10^{-7}$	$<5\times10^{-8}$
Temperature variation (typ. values)			
0-50 °C	$<1\times10^{-5}$	$<5\times10^{-8}$	$<5\times10^{-9}$
20-26 °C	$<3\times10^{-6}$	$<2\times10^{-8}$	$<1\times10^{-9}$
Short-term Stability: t = 1 s	Not specified	$<1\times10^{-10}$	$<1\times10^{-11}$
Root Allan Variance: t = 10 s	Not specified	$<1\times10^{-10}$	$<1\times10^{-11}$
Power-on Stability	NA	$<1\times10^{-7}$	$<1\times10^{-8}$
Deviation versus final value after 24h ON time, after a warm-up time of:	30 min	30 min	10 min
Total Uncertainty, for Operating Temperature 20 °C to 26 °C, at 2σ (95%) Confidence Interval			
1 year after calibration	$<7\times10^{-6}$	$<2.4\times10^{-7}$	$<0.6\times10^{-7}$
2 years after calibration	$<1.2\times10^{-5}$	$<4.6\times10^{-7}$	$<1.2\times10^{-7}$

*1 After 1 month of continuous operation.

Physical

Dimension	mm	in.
Height	90	3.6
Width	210	8.25
Depth	395	15.6
Weight	**kg**	**lb.**
Net	2.7	5.8
Shipping	3.5	7.5

Ordering Information

Models

Model	Description
FCA3000	Timer/Counter/Analyzer 300 MHz / 100 ps
FCA3003	Timer/Counter/Analyzer 3 GHz / 100 ps
FCA3020	Timer/Counter/Analyzer 20 GHz / 100 ps
FCA3100	Timer/Counter/Analyzer 300 MHz / 50 ps
FCA3103	Timer/Counter/Analyzer 3 GHz / 50 ps
FCA3120	Timer/Counter/Analyzer 20 GHz / 50 ps

FCA3000/3100 Series Include: Timer/Counter, line cord, calibration certificate, Quick Start User Manual, CD-ROM with user manual (English, French, German, Spanish, Simplified Chinese, Traditional Chinese, Korean, Russian, Japanese), Programmer's Guide, Technical Specifications, Trial version of TimeView™ Software, and CD-ROM with National Instruments LabVIEW SignalExpress™ Tektronix Edition, Limited Edition Software.

Please specify power plug when ordering.

Instrument Options

Option	Description
MS	Medium-stability Oven Time Base
HS	High-stability Oven Time Base
RP	Rear-panel Connectors

Power Plug Options

Option	Description
A0	North America
A1	Universal Euro
A2	United Kingdom
A3	Australia
A5	Switzerland
A6	Japan
A10	China
A11	India
E1	UK and Euro (FCA3000 and FCA3100 only)

Service Options

Option	Description
CA1	Provides a single calibration event or coverage for the designated calibration interval, whichever comes first
C3	Calibration Service 3 Years
C5	Calibration Service 5 Years
D1	Calibration Data Report
R5	Repair Service 5 Years

Recommended Accessories and Software

Accessory	Description
HCTEK4321	Hard Carrying Case
AC4000	Soft Carrying Case
174-4401-xx	USB Host to Device Cable, 3 ft.
012-0991-xx	GPIB Cable, Double Shielded
012-1256-xx	BNC Male to BNC Male, Cable Shielded, 9 ft., 50 Ω
012-0482-xx	BNC Male to BNC Male, Cable Shielded, 3 ft., 50 Ω
SIGEXPTE	National Instruments SignalExpress™ Tektronix Edition Interactive Measurement Software – Professional Version
TVA3000	TimeView™ Modulation Domain Analysis Software

CE

ISO 9001 Product(s) are manufactured in ISO registered facilities.

GPIB IEEE-488

Tektronix®

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